Experiences in African drylands with integrated soil system management: the use of Zai, Microdose and Warrantage Systems

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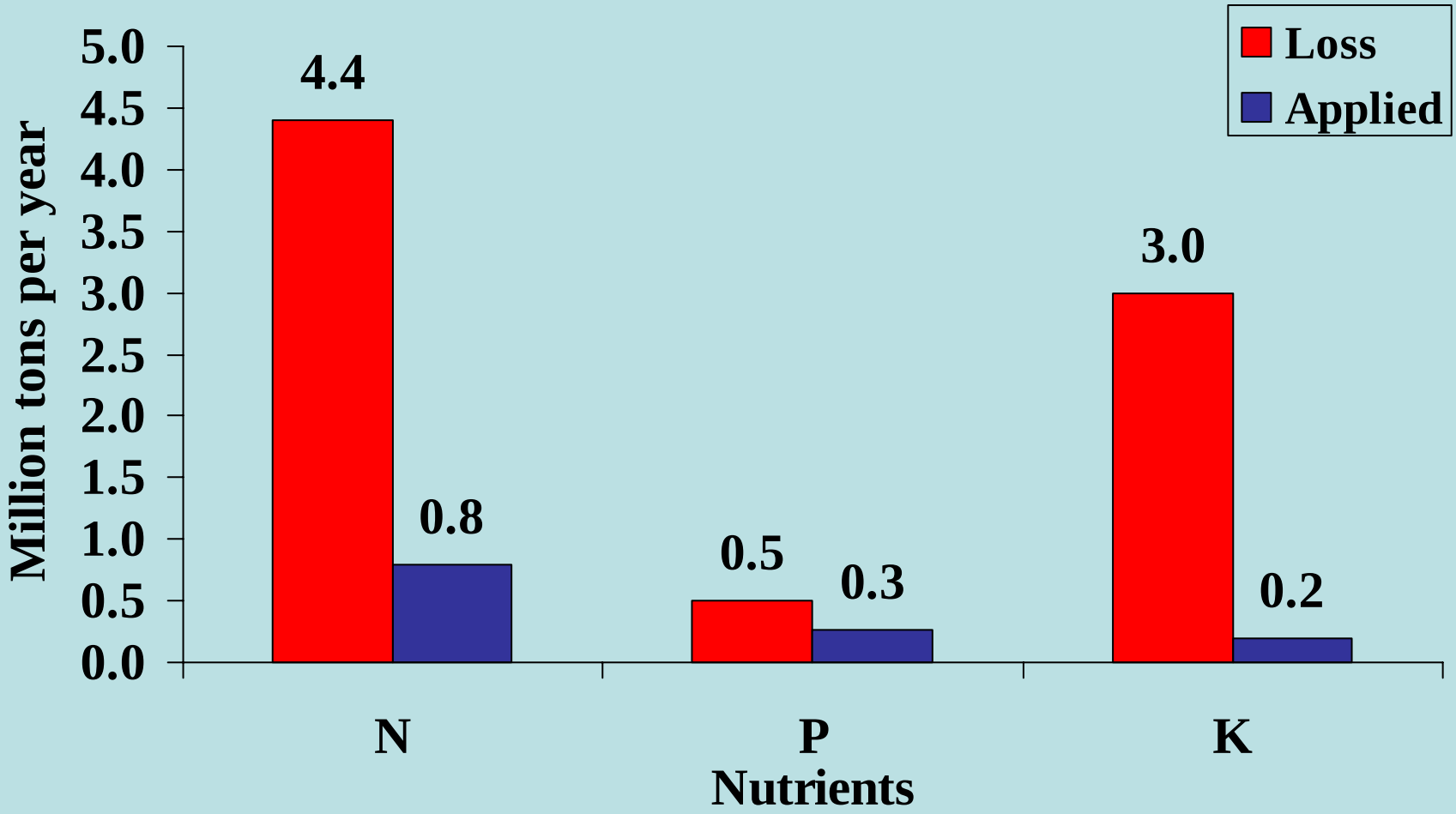
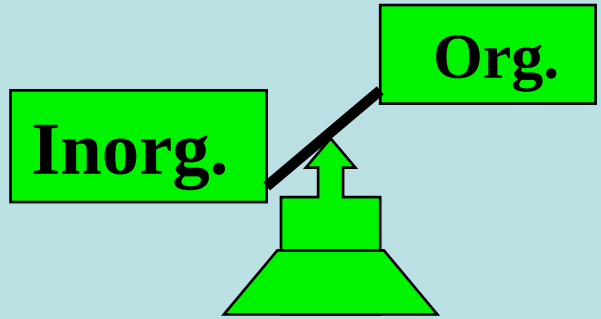
Macronutrient application versus loss in Africa



Background

- Poor soil fertility, rather than drought, is the major food-production constraint across much of the West African Sahel
- Malnourished plants have poor root systems and cannot collect the rainwater that falls resulting in high runoff and evapotranspiration
- Few small-scale farmers in these drought-prone regions use fertilizer due to cost limitations and the perceived risks of crop failure

Tropical soil fertility research



70's

- first paradigm (Sanchez, 1994):

'overcome soil constraints to fit plant requirements through purchased inputs'

- large success in Asia/Latin America

- subsidies on fertilizer in a number of African countries

Fertilizer prices

	Metric ton Urea(FOB) US$
Europe	90
Mombasa or Beira	400
Western Kenya	500
Malawi	770

Quantity and quality of manure available

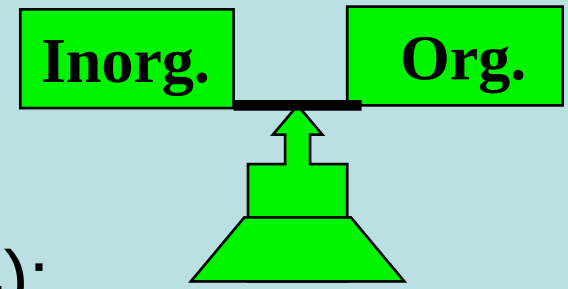
Recommended manure application levels are often as high as 20 tons/ha/yr but less than 700kg is available in semi-arid W. Africa

Has low and highly variable nutrient contents ranging from 0.5 to 2% N

Losses of nutrients are also high

Potential livestock transfer of nutrients in W. Africa is 2.5 kg N and 0.6 kg P per hectare of cropland

Tropical soil fertility research



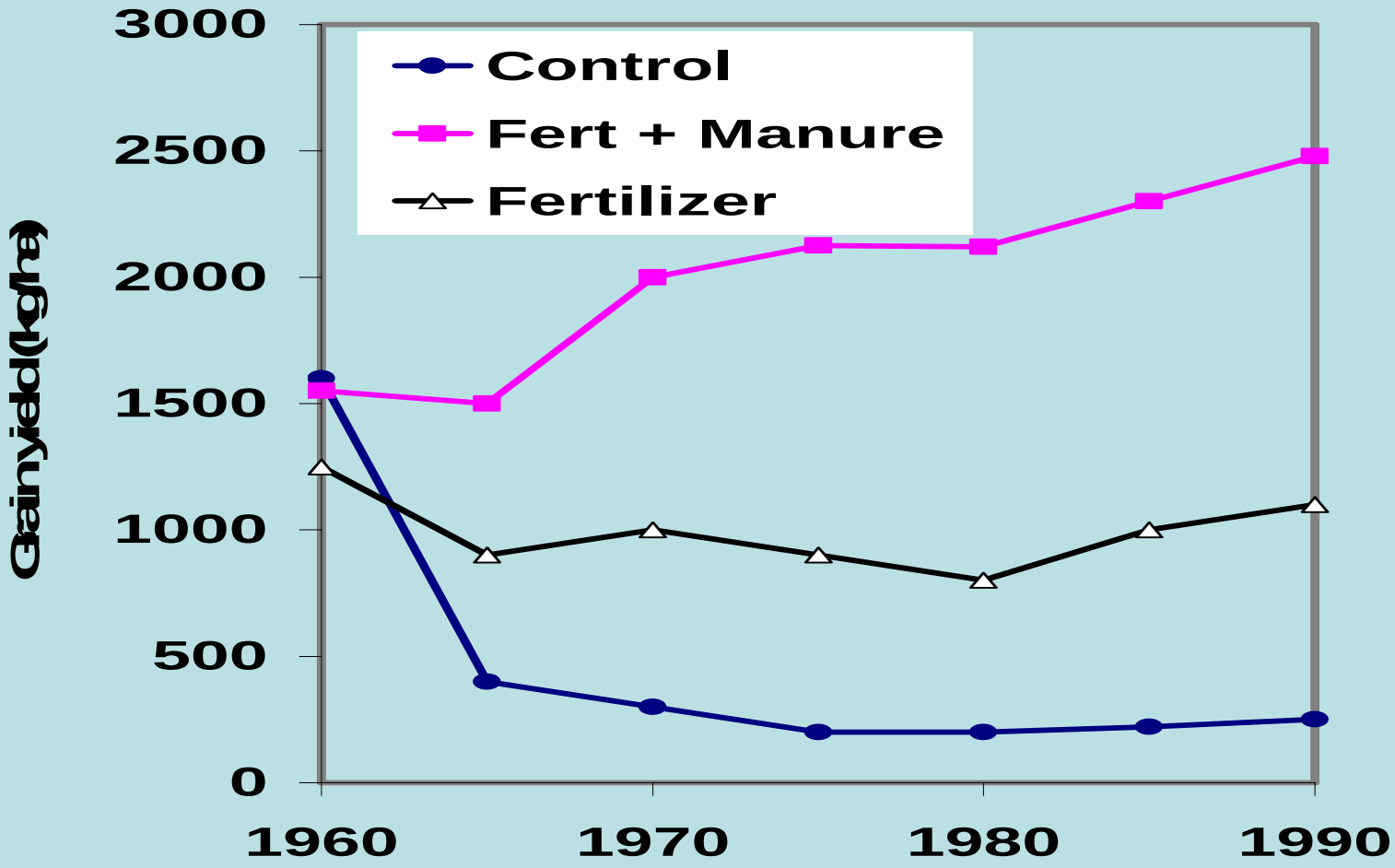
Mid-90's

- Second paradigm (Sanchez, 1994):

'overcome soil constraints by relying on biological processes by **adapting germplasm** to adverse soil conditions, enhancing **soil biological activity**, and optimizing nutrient cycling to **minimize external inputs** and **maximize their use efficiency**

- Need for organic matter (maintenance of soil physico-chemical health) and inorganic fertilizer (nutrients)

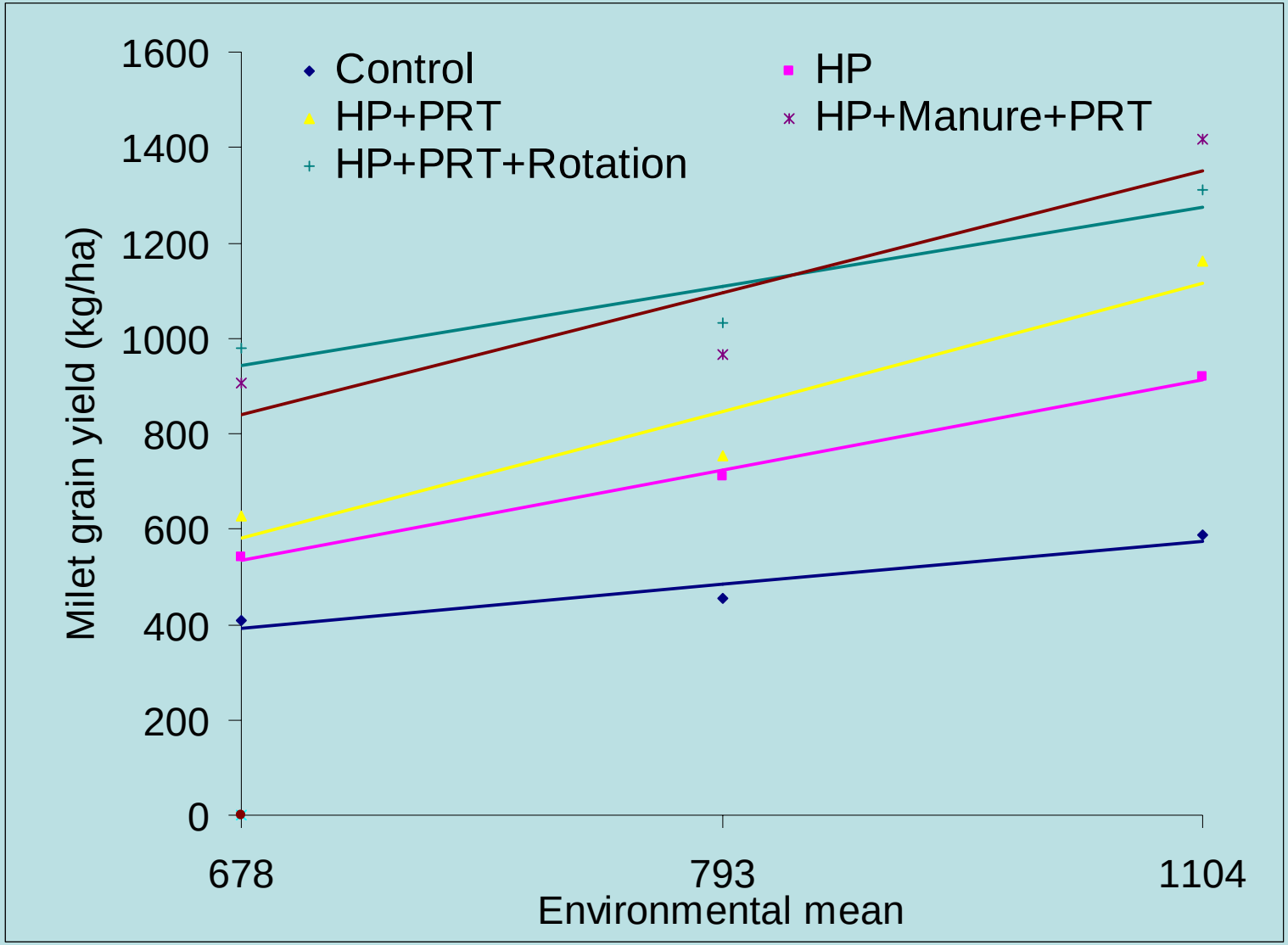
Micro dose



Sorghum grain yield as affected by mineral and organic fertilizers over time.

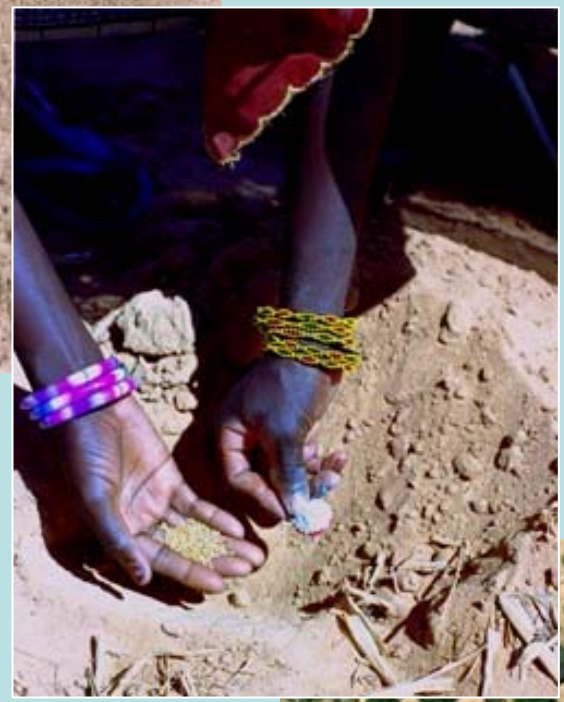
Effect of microdose on millet grain yield in Karabedji, Niger

Treatments	Millet grain yield (kg ha^{-1})
1. Farmers' practices	487
2. NPK HP	1030
3. DAP HP	924
4. PRT+NPK HP	1325



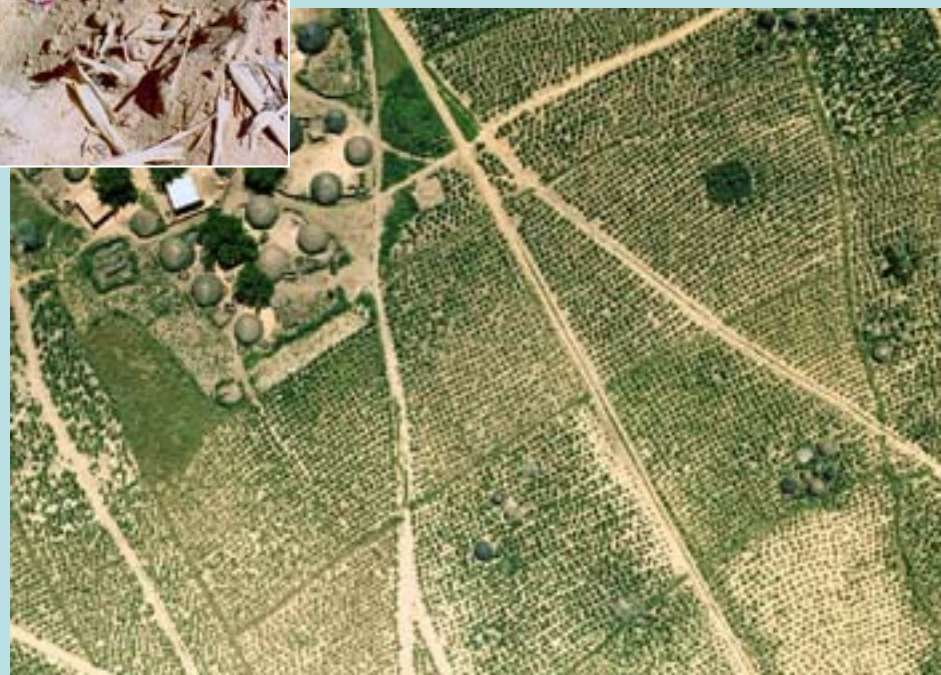
Effect of HP on millet grain yield, Sadore, Niger, 1998-2000

Grey To Green



4 kg P per ha
with millet seed

‘Coke Cap’ Microdosing



Zaï technique for Soil and water Conservation (SWC) in the African drylands

- Zaï is a traditional technique for conserving water and rehabilitating degraded land
- Practiced mainly in Mali, Burkina Faso and Niger
- Also known as *tassa* in Niger

Construction of Zaï

- The zaï system is a series of man made pits, or holes, dug on abandoned, or unused land
- The purpose of creating the holes is to capture runoff precipitation, because the land is typically less permeable to water
- Zaï pits are dug approximately 80 cm apart to a depth of 5 to 15 cm and with a diameter of 15 to 50 cm

Plate 1: Zaï pits or Tassa, for water harvesting - Illela, Niger

Effect of planting pits (zaï) and nutrient application on sorghum grain yield

Technology	**Sorghum yield (kg ha^{-1})**
Only planting pits	200
Pit + cow dung	700
Pit + Mineral fertilizers	1400
Pit + Dung and fertilizers	1700

Reij and Thiombiano (2003)

The ‘warrantage’ system

- Microdosing resulted in surplus production
- Farmers suffered low produce prices at harvest
- Prices rose up to 3 times 10 months later
- Warrantage encourages farmers to store their produce a little longer to benefit from the improved prices

Success of the “warrantage system”

- The incomes of farmers using fertilizer “micro-dosing” and inventory credit system or “Warrantage” have been observed to increase by 52 to 134%

Thank you